Cell-derived matrix coatings for polymeric scaffolds.

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Public Summary:
Abstract Cells in culture deposit a complex extracellular matrix that remains intact following decellularization and possesses the capacity to modulate cell phenotype. The direct application of such decellularized matrices (DMs) to 3D substrates is problematic, as transport issues influence the homogeneous deposition, decellularization, and modification of DM surface coatings. In an attempt to address this shortcoming, we hypothesized that DMs deposited by human mesenchymal stem cells (MSCs) could be transferred to the surface of polymeric scaffolds while maintaining their capacity to direct cell fate. The ability of the transferred DM (tDM)-coated scaffolds to enhance the osteogenic differentiation of undifferentiated and osteogenically induced MSCs under osteogenic conditions in vitro was confirmed. tDM-coated scaffolds increased MSC expression of osteogenic marker genes (BGLAP, IBSP) and intracellular alkaline phosphatase production. In addition, undifferentiated MSCs deposited significantly more calcium when seeded onto tDM-coated scaffolds compared with control scaffolds. MSC-seeded tDM-coated scaffolds subcutaneously implanted in nude rats displayed significantly higher blood vessel density after 2 weeks compared with cells on uncoated scaffolds, but we did not observe significant differences in mineral deposition after 8 weeks. These data demonstrate that DM-coatings produced in 2D culture can be successfully transferred to 3D substrates and retain their capacity to modulate cell phenotype.

Scientific Abstract:
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